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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,863	06/06/2005	Kazutaka Kobayashi	0300.1185	7195

21171 7590 09/01/2009

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EXAMINER	
ELVE, MARIA ALEXANDRA	

ART UNIT	PAPER NUMBER
3742	

MAIL DATE	DELIVERY MODE
09/01/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/537,863	Applicant(s) KOBAYASHI, KAZUTAKA	
	Examiner M. Alexandra Elve	Art Unit 3742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _27 May 2009_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-6_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-6_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _06 June 2005_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 & 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inagawa et al. (USPN 5,166,493) in view of Gaku et al. (USPN 6,280,641) and AAPA (Applicant Admitted Prior Art).

Inagawa et al. discloses a two-step boring process. A first step is a high speed rough boring using a long wavelength laser and second step uses short wavelength laser. Long wavelength lasers may include CO_2 lasers and short wavelengths lasers may include excimer lasers. The long wavelength laser is used to rapidly clean out the via (which generates a black carbide); while the short wavelength laser is used for final cleaning and the generation of carbide black is suppressed. The excimer laser removes the carbide (modified material; a residual from the long wavelength boring). The printed circuit boards are constructed of resin (epoxy), glass and copper foil.

Although Inagawa et al. does not specifically disclose IR and UV lasers, it is known in the art that a short wavelength laser is a UV laser and a long wavelength laser is an IR laser. This is evidenced in reference Bloemeke et al. (USPAP 2004/0112881). In addition Bloemeke et al. discloses that a long wavelength laser, IR laser, is a CO_2

laser. Thus Inagawa et al. inherently teaches an IR laser (long wavelength CO_2 laser) and a UV laser (short wavelength excimer laser).

Although Inagawa et al. does not specifically teach an inorganic filler, a glass is taught. It is known in the art that glass in a printed wire board is classified as an inorganic filler; see Kawaguchi et al. (USPAP 2003/0078333). Thus Inagawa et al. inherently teaches an inorganic filler (glass).

Inagawa et al. discloses a resin and glass (filler) printed wire board, but not inorganic fillers such as barium titanate, titanium oxide, strontium titanate and barium-strontium titanate.

Gaku et al. (‘641) discloses a printed wire having micro-via holes. A CO_2 laser drills the holes removing resin. The resin of the board is mixed with 10 to 60% inorganic insulating filler. Components of the board may include titanium oxide, rare earth metal oxides and barium sulfate. Other inorganic insulating fillers are silicas (natural silica, calined silica and amorphous silica), white carbon, titanium white, aerogel, clay, talc, wollantonite, natural mica (BaTiO compound), synthetic mica, kaolin, magnesia, alumina and perlite.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use titanium oxide and so forth, as taught by Gaku et al. (‘641) in the Inagawa et al. circuit board because are standard components of the boards.

AAPA states that titanium oxide does not absorb within the infrared region and Gaku et al. ('641) discloses titanium oxide. Additionally, AAPA states that UV is capable for cleaving C-C bonds in resin and Inagawa et al. discloses resin and the use of UV.

Claims 2 & 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inagawa et al., Gaku et al. ('641) and AAPA, as stated above and further in view of Gaku et al. (USPAP 2003/0049913).

Inagawa et al. teaches a short wavelength laser; an excimer laser, but not a UV-YAG laser.

Gaku et al. ('913) discloses that a UV laser such as an excimer laser and an Nd:YAG laser may be used to form a hole (via) and that UV is a short wavelength. IR is disclosed.

It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the YAG laser as taught by Gaku et al. ('913) for the excimer laser in Inagawa et al. because these are functional equivalents.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Inagawa et al., Gaku et al. ('641) and AAPA, as stated above and further in view of Bui (USPN 6,413,820) or Welsch et al. (USPN 6,22,173).

Gaku et al. ('641) discloses a titanium oxide filler material for circuit boards but does not teach the dielectric constant of the material.

Bui discloses a semiconductor substrate having titanium oxide with a dielectric constant of about 40.

It would have been obvious to one of ordinary skill in the art at the time of the invention to determined the dielectric constant of the filler material, as taught by Bui in

the Inagawa et al. and Gaku et al. ('641) board because this is an important material parameter in the semiconductor industry.

Welsch et al. discloses a titanium oxide dielectric constant of about 165 for the pure oxide.

It would have been obvious to one of ordinary skill in the art at the time of the invention to determine the dielectric constant of the filler material, as taught by Bui in the Inagawa et al. and Welsch et al. board because this is an important material parameter in the semiconductor industry.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Inagawa et al., Gaku et al. (‘641) and AAPA, as stated above and further in view of Den et al. (USPN 6,649,824) or Yaita et al. (USPN 6,635,232).

Gaku et al. (‘641) discloses a titanium oxide filler material for circuit boards but does not teach the band gap of the material.

Den et al. discloses a photoelectric conversion device. Titanium oxide, a stable semiconductor, has a band gap not less than 3 eV.

It would have been obvious to one of ordinary skill in the art at the time of the invention to determine the band gap, as taught by Den et al. in the Inagawa et al. and Gaku et al. ('641) board because this is an important material property in the semiconductor industry.

Yaita et al. discloses the band gap of titanium oxide of being about 3.2 eV.

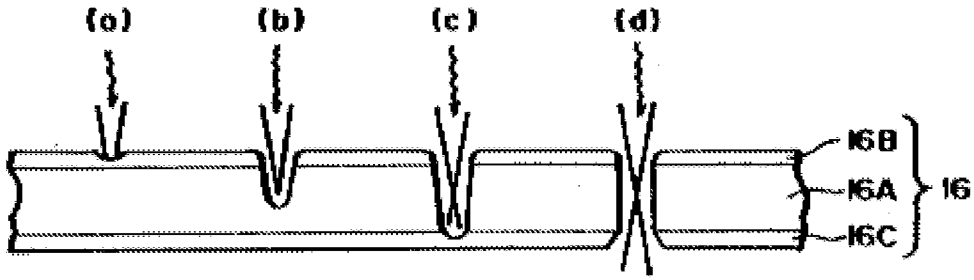
It would have been obvious to one of ordinary skill in the art at the time of the invention to determine the band gap, as taught by Yaita et al. in the Inagawa et al. and Gaku et al. ('641) board because this is an important material property in the semiconductor industry.

Response to Arguments

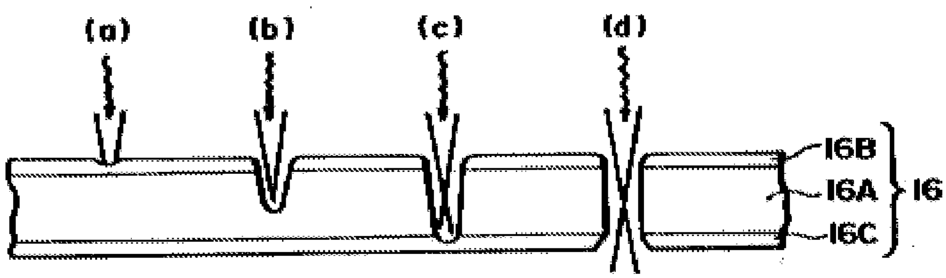
Applicant's arguments filed 5/27/09 have been fully considered but they are not persuasive.

Applicant argues that the carbide does not cover the bottom. The examiner respectfully disagrees because all the areas that contained resin will have a carbide modified layer. This layer will cover the side walls and the bottom of the via.

Applicant argues that Inagawa does not teach “form a via hole with an underlying layer exposed at its bottom”. The examiner respectfully notes that applicant’s claim does not state this, but rather the first step forms a via hole and the second step removes the modified layer of resin remaining at the bottom of the hole and form a via hole with an underlying layer exposed at its bottom. Inagawa et al. specifically teaches the first laser forming a via in which a carbide black (modified layer) is formed in the via. The second laser removes the carbide. A third step may be used to remove the underlying layer exposed at its bottom (i.e. step d). Figures 4 & 8 demonstrate the process:



F I G. 4



F I G. 8

Applicant's argues that the Inagawa et al. is silent with respect to wavelengths. The examiner respectfully disagrees because Inagawa et al. discloses the use of long and short wavelengths.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Alexandra Elve whose telephone number is 571-272-1173. The examiner can normally be reached on 7:30-4:00 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tu B. Hoang can be reached on 571-272-4780. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

August 30, 2009.

/M. Alexandra Elve/
Primary Examiner, Art Unit 3742